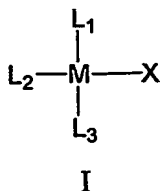


CLAIMS

1. A complex of formula I



wherein

M is Ca, Mg, Ba or Sr;

L_1 is selected from R^1O , R^2S , R^3R^4N , R^5R^6P , a substituted or unsubstituted cyclopentadienide and a substituted or unsubstituted pyrazolyl group, where R^1 - R^6 are each independently H or hydrocarbyl;

L_2 is selected from R^7R^8O , R^7R^8S , $R^7R^8R^9N$, $R^7R^8C=NR^9$, $PR^7R^8R^9$, or a substituted or unsubstituted heterocycle containing one or more O, N or S atoms, where R^{7-9} are each independently H or a hydrocarbyl group; or L_1 and L_2 are linked to form a bidentate ligand;

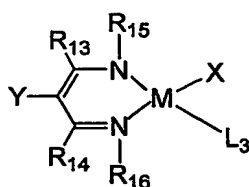
L_3 is absent or is a solvent molecule, or a neutral ligand as defined for L_2 , wherein L_3 may be the same or different to L_2 ; or L_3 is linked to a further metal centre; or L_1 , L_2 and L_3 are linked to form a tridentate ligand; and

X is an alkyl group, an aryl group, an amide group, an aryloxy or an enolate group of formula $R^{10}R^{11}C=CR^{12}O-$, wherein R^{10-12} are each independently H or hydrocarbyl;

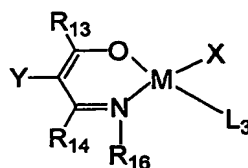
with the proviso that when L_1 and L_2 are $\{HC(C(CH_3)=N-2,6-^iPr_2C_6H_3)_2\}$ and M is magnesium, X is other than Me or tBu .

2. A complex according to claim 1 wherein R^1 and R^2 are hydrocarbyl, and R^{3-6} are H or hydrocarbyl.

3. A complex according to claim 1 wherein R^1 and R^2 are each independently selected from branched or unbranched alkyl, branched or unbranched alkenyl, or aryl, each of which may be substituted or unsubstituted.
4. A complex according to claim 1 wherein L_1 and L_2 are linked to form a bidentate ligand selected from a beta-diketiminate and a beta-ketoiminate.
5. A complex according to claim 4 of formula II or III



II



III

wherein

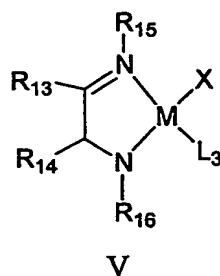
Y is H, hydrocarbyl or CN;

R^{13-16} are each independently selected from H and hydrocarbyl; or Y and R^{13} are linked to form a hydrocarbyl group; and
 L_3 absent or as defined in claim 1.

6. A complex according to claim 5 wherein
 Y is selected from H, CN, alkyl, aryl, haloalkyl or heteroalkyl;
 R^{13-16} are each independently selected from alkyl, aryl, heteroalkyl, haloalkyl, cycloalkyl and a heterocyclic ring containing at least one O, N or S atom; or Y and R^{13} are linked to form an aryl group; and
 L_3 is absent or is selected from R^7R^8O , R^7R^8S , $R^7R^8R^9N$, $R^7C=NR^8$, $PR^7R^8R^9$, thiophene and tetrahydrofuran, where R^{7-9} are each independently H or a hydrocarbyl group.

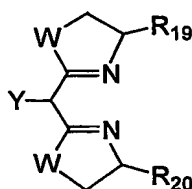
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7. A complex according to claim 1 of formula V



wherein R^{13-16} are as defined in claim 5 or claim 6, and where R^{13} and R^{15} are optionally linked to form an aryl group.

8. A complex according to claim 1 wherein L_1 and L_2 form a bidentate ligand of formula VIII



wherein

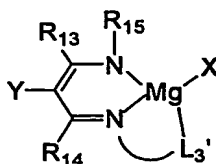
Y is as defined above;

W is O, NH, NR' or CH_2 where R' is hydrocarbyl; and

R^{19-20} are as defined for R^{13-16} above.

9. A complex according to any one of claims 1 to 3 wherein L_1 , L_2 and L_3 are linked to form a tridentate ligand.
10. A complex according to claim 9 wherein L_1 , L_2 and L_3 are linked to form a tridentate ligand selected from a beta-diketiminato with a pendant donor group, and a Schiff base derivative with a pendant donor arm.

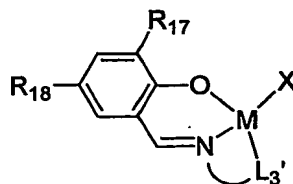
11. A complex according to claim 10 of formula VI



VI

wherein L_3' is defined as for L_3 in claim 1, and is linked to the nitrogen of the bidentate ligand via a linker group.

12. A complex according to claim 10 wherein said complex is of formula VII

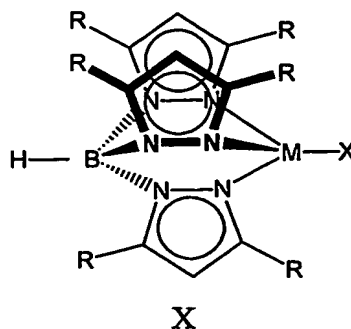


VII

wherein L_3' is defined as for L_3 in claim 1, and is linked to the nitrogen of the bidentate ligand via a linker group, and R^{17-18} are as defined for R^{13-16} above.

13. A complex according to claim 11 or claim 12 wherein the linker group is $(CH_2)_n$ where n is 0-6, an arylene group, or SiR_2 , where R is hydrocarbyl.

14. A complex according to claim 1 of formula X



wherein each R is independently H or a hydrocarbyl group.

15. A compound according to any preceding claim wherein X is an alkyl group
16. A compound according to claim 15 wherein X is ⁱPr.
17. A compound according to any one of claims 1 to 14 wherein X is an amide group.
18. A compound according to claim 17 wherein X is NPrⁱ₂.
19. A compound according to any one of claims 1 to 14 wherein X is an enolate group of formula R¹⁰R¹¹C=CR¹²O⁻, wherein R¹⁰ and R¹¹ are H and R¹² is an aryl group.
20. A compound according to claim 19 wherein X is -OC(=CH₂)Ar, wherein Ar is 2,4,6,-Me₃C₆H₂.
21. A complex comprising a dimer of a complex according to any preceding claim.
22. A complex according to claim 1 selected from the following:
 {HC(C(CH₃)=N-2,6-ⁱPr₂C₆H₃)₂}MgⁱPr [1];
 [{HC(C(CH₃)=N-2,6-ⁱPr₂C₆H₃)₂}Mg(OC(=CH₂)Ar)]₂ [2];
 [{HC(C(CH₃)=N-2,6-ⁱPr₂C₆H₃)₂}Mg(OC(=CH₂)Ar)•Et₂O] [3];

wherein Ar = 2,4,6-Me₃C₆H₂;

{HC(C(^tBu)=N-2,6-ⁱPr₂C₆H₃)₂)Mg(OC(=CH₂)-2,4,6-Me₃C₆H₂) [4];

{HC(C(Me)=N-2,6-ⁱPr₂C₆H₃)(C(Me)=N-2-OMeC₆H₄)}MgⁱPr [5];

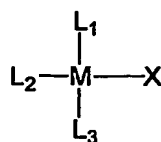
{HB(3,5-Me₂C₃N₂H)₃}Mg(OC(=CH₂)-2,4,6-Me₃C₆H₂) [6];

{HC(C(Me)=N-2,6-ⁱPr₂C₆H₃)₂}Ca(OC(=CH₂)-2,4,6-Me₃C₆H₂)•THF [7];

[{HC(C(Me)=N-2,6-ⁱPr₂C₆H₃)₂}Ca(OC(=CH₂)-2,4,6-Me₃C₆H₂)]_n [8] where n = 1 or 2; and

{HC(C(CH₃)=N-2,6-ⁱPr₂C₆H₃)₂}MgNPrⁱ₂ [9].

23. Use of a complex of formula Ia as a polymerisation initiator,



Ia

wherein

M is Ca, Mg, Ba or Sr;

L₁ is selected from R¹O, R²S, R³R⁴N, R⁵R⁶P, a substituted or unsubstituted cyclopentadienide, and a substituted or unsubstituted pyrazolyl group, where R¹⁻⁶ are each independently H or hydrocarbyl;

L₂ is selected from R⁷R⁸O, R⁷R⁸S, R⁷R⁸R⁹N, R⁷R⁸C=NR⁹, PR⁷R⁸R⁹, and a substituted or unsubstituted heterocycle containing one or more O, N or S atoms, where R⁷⁻⁹ are each independently H or a hydrocarbyl group; or L₁ and L₂ are linked to form a bidentate ligand;

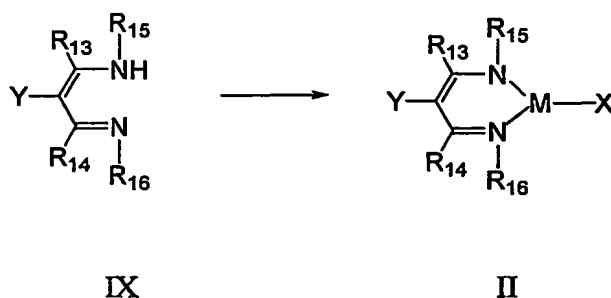
L₃ is absent or is a solvent molecule, or a neutral ligand as defined for L₂, wherein L₃ may be the same or different to L₂; or L₃ is linked to a further metal centre; or L₁, L₂ and L₃ are linked to form a tridentate ligand; and

X is an alkyl group, an aryl group, an amide group, or an enolate group of formula R¹⁰R¹¹C=CR¹²O⁻, wherein R¹⁰⁻¹² are each independently H or hydrocarbyl;

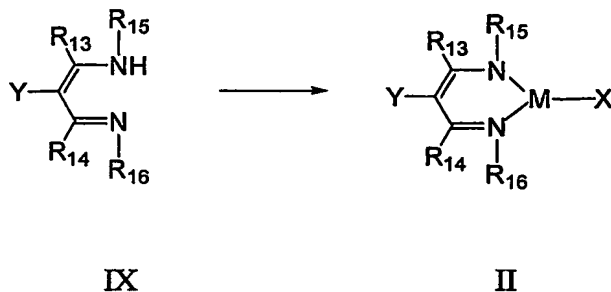
with the proviso that when L_1 and L_2 are $\{HC(C(CH_3)=N-2,6-^iPr_2C_6H_3)_2\}$, M is magnesium, X is other than Me or tBu .

24. Use according to claim 23 in the polymerisation of acrylate and/or alkyl acrylate monomers.
25. Use according to claim 23 or 24 which further comprises the use of a chain transfer reagent.
26. A process for the polymerisation of acrylate and/or alkylacrylate monomers, said process comprising contacting an initiating amount of a complex of formula Ia as defined in claim 23 with an acrylate and/or an alkylacrylate monomer in the presence of a suitable solvent.
27. A process according to claim 26 wherein the ratio of monomer to the complex is between 10:1 and $10^6:1$.
28. An article prepared by a process according to claims 26 or 27.
29. A composition comprising an acrylate and/or an alkylacrylate monomer and a complex of formula Ia as defined in claim 23.
30. A composition comprising poly(alkylacrylate) and poly(alkylmethacrylate) or copolymers thereof, and a complex of formula Ia as defined in claim 23.

31. A process for preparing a complex of formula II as defined in claim 5, where X is alkyl, said process comprising reacting a compound of formula IX with (a) n BuLi, and (b) XMgCl



32. A process for preparing a complex of formula II as defined in claim 5, where X is alkyl, said process comprising reacting a compound of formula IX with MgX_2



33. A process for preparing a complex of formula II, as defined in claim 5, where X is an enolate group of formula $R^{10}R^{11}C=CR^{12}O-$, said process comprising reacting the product obtained from the process of claim 31 or claim 32 with a compound of formula $HR^{10}R^{11}C-C(O)R^{12}$.
34. A method for producing polymethacrylate having greater than 75% syndiotacticity, said method comprising contacting methacrylate monomer with a complex of formula Ia as defined in claim 23 in the presence of a suitable solvent.

34

35. A method according to claim 34 which is carried out at a temperature in excess of -40°C .